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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/705,436	11/10/2003	Jeffrey A. Cook	203-0040 (FGT 3D5)	4595

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EXAMINER	
NGUYEN, TU MINH	
ART UNIT	PAPER NUMBER
3748	

DATE MAILED: 09/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/705,436	COOK ET AL.	
	Examiner	Art Unit	
	Tu M. Nguyen	3748	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 August 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. An Applicant's Amendment filed on August 14, 2006 has been entered. Claims 1, 9, 12, and 13 have been amended. Overall, claims 1-18 are pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office Action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4, 7-14, 17, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Hamburg et al. (U.S. Patent 5,282,360).

Re claims 1, 2, 9, and 10, as shown in Figures 4-6, Hamburg et al. disclose a method for controlling fuel injection into an engine (41) having an exhaust system with an emission control device (42) located therein, the method comprising:

- reading information from a downstream sensor (44) coupled in the emission control system downstream of the emission control device, the information including a substantially linear indication of exhaust air-fuel ratio, the linear indication being substantially linear across an entire range of air-fuel ratios from at least 12:1 to 18:1 (the downstream sensor (44) exhibits a sharp change at an air-fuel ratio at 14.7:1 within a first area designated as "linear region" and is mostly linear in a second area outside this first area; the second area covering the regions

designated as "Rich Region" and "Lean Region" (see Figure 1B, lines 41-47 of column 2, and lines 56-62 of column 3));

- reading information from the sensor (44) identifying a stoichiometric point, the information based on a measurement signal obtained from the sensor differently than a measurement signal used to produce the substantially linear indication (as indicated in Figure 5B, a sensor signal of 0.8 which indicated rich of stoichiometry is obtained);

- adjusting a setpoint (switch point) for an upstream sensor (43) based on the information (see lines 51-53 of column 4); and

- adjusting fuel injection into the engine based on the adjusted setpoint and a signal from the upstream sensor (see Figure 5C).

Re claims 3, in the method of Hamburg et al., the information from the downstream sensor (44) includes the substantially linear indication under a first set of conditions (rich or lean of stoichiometry), and includes the substantially non-linear indication of stoichiometry under a second set of conditions (engine air-fuel ratio of 14.7:1).

Re claim 4, in the method of Hamburg et al., the substantially non-linear indication is sampled from a signal providing the substantially linear indication at a preselected condition (engine air-fuel ratio of 14.7:1).

Re claim 12, as depicted in Figures 4-6, Hamburg et al. disclose a system comprising:

- a sensor (44) generating a first signal providing a substantially linear indication of exhaust air-fuel ratio, the linear indication being substantially linear across an entire range of air-fuel ratios from at least 12:1 to 18:1 (the downstream sensor (44) exhibits a sharp change at an air-fuel ratio at 14.7:1 within a first area designated as "linear region" and is mostly linear in

a second area outside this first area; the second area covering the regions designated as "Rich Region" and "Lean Region" (see Figure 1B, lines 41-47 of column 2, and lines 56-62 of column 3)), during a first set of conditions (Ramp Lean) (see Figures 5B and 1B), and a second signal generating a substantially non-linear indication of exhaust air-fuel ratio during a second set of conditions (Linear Feedback) (see Figures 5B and 1B); and

- a computer storage medium (47) having instructions encoded therein for controlling fuel injection into an engine (41) having an exhaust system with an emission control device (42) located therein, the medium comprising:

- code for reading the first and second signal from the sensor (44);

- code for adjusting a setpoint (switch point), for a feedback controller for an sensor (43) coupled upstream of the emission control device, based on the first and second signals (see lines 51-53 of column 4); and

- code for adjusting fuel injection into the engine based on the adjusted setpoint and a signal from the upstream sensor (see Figure 5C).

Re claims 7 and 17, in the method and system of Hamburg et al., the code for adjusting fuel injection into the engine further includes code for adjusting fuel injection into the engine based on an error between the adjusted setpoint and a signal from the upstream sensor (lines 51-53 of column 4).

Re claims 8, 11, and 18, in the method and system of Hamburg et al., the adjusted setpoint is adjusted to be a stoichiometric value (lines 10-12 of column 5).

Re claim 13, in the system of Hamburg et al, first signal and second signal are provided via an electronic circuit (47) coupled to the sensor (44), and wherein the emission control device (42) is located upstream of the sensor (44).

Re claim 14, in the system of Hamburg et al., the second signal is sampled from the first signal during the second set of operating conditions (Linear Feedback).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 5, 6 and 15, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamburg et al. as applied to claims 1 and 12, respectively, above, in view of Schumacher et al. (U.S. Patent 6,116,021).

Re claims 5 and 15, the method and system of Hamburg et al. disclose the invention as cited above, however, fail to disclose that the upstream sensor is a HEGO sensor.

As indicated on lines 31-38 of column 1, Schumacher et al. teach that it is conventional in the art to utilize Heated Exhaust Gas Oxygen (HEGO) sensors for several On-Board Diagnostic (OBD) systems to control an engine air-fuel ratio to reduce harmful emissions in the exhaust gas and to diagnose a working condition of a catalytic converter. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have replaced the

upstream sensor of Hamburg et al. with a HEGO sensor as taught by Schumacher et al., since the use thereof would have been routinely utilized by those with ordinary skill in the art.

Re claims 6 and 16, in the modified method and system of Hamburg et al., the upstream sensor is a UEGO sensor (see claim 7 of Schumacher et al.).

6. Claims 1, 2, 6, 9, 10, 12, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kakuyama et al. (U.S. Patent 6,637,194) in view of Hamburg et al.

Re claims 1, 2, 9, 10, and 12, as depicted in Figures 1, 9, and 10, Kakuyama et al. disclose a system and a method for controlling fuel injection into an engine (1), the system comprising:

- a sensor (13) generating a first signal (VRO2) providing an indication of exhaust air-fuel ratio during a first set of conditions (step S52 with YES answer) (also see Figure 9B), and a second signal (VRO2) generating an indication of exhaust air-fuel ratio during a second set of conditions (steps S52 and S55 with NO answer (i.e., VRO2 is within a region bounded by curves C and D)); and

- a computer storage medium (2) having instructions encoded therein for controlling fuel injection into an engine (1) having an exhaust system with an emission control device (10) located therein, the medium comprising:

- code (step S51) for reading the first and second signal from the sensor (13);

- code (step S53 or S56) for adjusting a setpoint (VFAF), for a feedback controller for an sensor (3) coupled upstream of the emission control device (10), based on the first and second signals; and

- code for adjusting fuel injection into the engine based on the adjusted setpoint (VFAF) and a signal from the upstream sensor (see the Abstract).

In Kakuyama et al., the sensor (13) is an on-off type of oxygen sensor (lines 59-64 of column 6). They, however, fail to disclose that this type of sensor generates a first signal providing a substantially linear indication of exhaust air-fuel ratio across an entire range from at least 12:1 to 18:1, and a second signal generating a substantially non-linear indication of exhaust air-fuel ratio at or about stoichiometry.

As shown in Figure 1B, Hamburg et al. teach that such on-off type oxygen sensor used as sensor (13) in Kakuyama et al. exhibits a first signal providing a substantially linear indication of exhaust air-fuel ratio across an entire range from at least 12:1 to 18:1 (the downstream sensor (44) in Hamburg et al. exhibits a sharp change at an air-fuel ratio at 14.7:1 within a first area designated as "linear region" and is mostly linear in a second area outside this first area; the second area covering the regions designated as "Rich Region" and "Lean Region" (see Figure 1B, lines 41-47 of column 2, and lines 56-62 of column 3)), and a second signal generating a substantially non-linear indication of exhaust air-fuel ratio at or about stoichiometry. Therefore, based on the teaching of Hamburg et al., it is obvious to one with ordinary skill in the art that the sensor (13) in Kakuyama et al. exhibits the characteristics as claimed.

Re claims 6 and 16, in the method and system of Kakuyama et al., the upstream sensor (3) is a UEGO sensor (lines 51-58 of column 6).

Response to Arguments

7. Applicant's arguments with respect to the references applied in the previous Office Action have been fully considered but they are not persuasive.

In response to applicant's argument that Hamburg et al. fail to disclose a downstream sensor exhibiting a substantially linear indication of exhaust air-fuel ratio across an entire range of air-fuel ratios from at least 12:1 to 18:1 (page 7 of the Applicant's Amendment), the examiner respectfully disagrees.

As shown in Figure 4, Hamburg et al. disclose an exhaust system having an emission control device (42) and a downstream sensor (44). As illustrated in Figure 1B, the downstream sensor in Hamburg et al. is depicted to exhibit a sharp change at an air-fuel ratio at 14.7:1 within a first area designated as "linear region" and is mostly linear in a second area outside this first area; wherein the second area covers the regions designated as "Rich Region" and "Lean Region". The paragraphs on lines 41-47 of column 2 and lines 56-62 of column 3 in Hamburg et al. read, respectively, as follows:

"*When an internal combustion engine is operating on the rich side of a catalyst window (i.e., rich of stoichiometry as indicated by a post-catalyst EGO sensor), the output of the EGO sensor is essentially saturated at a "high" output voltage and does not give any meaningful information as to how much the engine A/F is rich of stoichiometry (See FIGS. 1A and 1B).*"

"*When the engine is operating on the lean side of the catalyst window (i.e., lean of stoichiometry as indicated by the post-catalyst EGO sensor), the output of the EGO sensor is essentially saturated at a low output voltage and does not give any meaningful information as to how much the engine A/F is lean of stoichiometry (See FIG. 1B).*"

As indicated in the above first paragraph, the downstream sensor (44) in Hamburg et al. is said to give only a "high" output voltage (i.e., approximately 0.8 volt) and does not give any actual air-fuel ratio value of the exhaust gas stream when the gas stream is on the rich side of stoichiometry. By the same token, from the above second paragraph, the downstream sensor in Hamburg et al. is said to give only a "low" output voltage (i.e., approximately 0.1 volt) and does not give any actual air-fuel ratio value of the exhaust gas stream when the gas stream is determined to be on the lean side of stoichiometry. In the art of engine air-fuel ratio control, since the rich side of stoichiometry is as low as 12:1 in terms of air to fuel ratio; and the lean side of stoichiometry is as high as 18:1 in terms of air to fuel ratio, it is clear that Hamburg et al. disclose a downstream sensor (44) that exhibits, except in a narrow region between 14.7:1 to 14.75:1 as accepted by Applicant, a substantially linear indication of an exhaust air-fuel ratio across an entire range of air-fuel ratios from at least 12:1 to 18:1.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Communication

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tu M. Nguyen

TMN

September 3, 2006

Tu M. Nguyen
Primary Examiner
Art Unit 3748